Willamette National Forest Pilot Road Analysis

Appendix A

Economics Process Paper

October 1998

Errata Correction Sheet (02/09/2001)

Willamette National Forest

Pilot Road Analysis

Page 5 Executive Summary

1.2. Key Analysis Results and Findings

Second paragraph should read:

- Economics alone (financial efficiency) does not support large-scale road ~~closures or~~ decommissioning in spite of the current imbalance in funding available for road system management.

Appendix A: Economics Process Paper

Page A-5, Item 3 of the 5th paragraph should read:

3. To close the same road would cost $2,000 for closure, $100 a year in minimal maintenance. ~~and $1,600 expected every 10 years for repairs~~.

Page A-5, Item 3 of the 6th paragraph should read

The goal is to find which scenario(s) prove to be financial viable over the next 20 years by requiring a 20 year discounted investment less than the no change alternative. Under the above assumptions, the no change scenario would require a discounted investment of $5,459. To decommission the same road would require an upfront investment of $10,000 with no additional expenses expected. The second scenario does not make sense to implement for solely fiscal reasons. It is far cheaper to maintain the road at $5,459 as opposed to spending $10,000 to decommission. To close the road would require a discounted investment of ~~$5,270~~ $3459. In other words it would be cheaper to close the road than to keep it open. ~~however, the two scenarios are very close~~

Introduction

The history behind the Willamette's current road system has an important role in how we look into its financial efficiency. The Forest's roads were built primarily to access timber harvest units and for other administrative purposes. Some of those same roads also provided the primary access to lakes, trails, campgrounds, and much needed access during firefighting operations. High timber revenues coupled with recreation benefits, and access for firefighters made the roads financially efficient to build and maintain. This was also reinforced in the 1990 Willamette Forest Plan where continued road building to ``complete'' the Forest's road system was part of the preferred alternative (USDA 1990). Lawsuits and court injunctions ensued over spotted owl habitat limiting harvest levels. In 1994 the Northwest Forest Plan was implemented and resulted in more than 75% of the timber suited lands available for timber harvest now in no-harvest land allocations. With this series of events the primary source of revenue that maintained the current road system, fundamentally changed. The objective of the economic questions is to address costs, budget, and overall financial efficiency of the current road system.

Process Description and Documentation

In this analysis we addressed three key questions listed in the order they are dealt with in this paper:

EC-1: *How does the road system affect the direct costs and direct revenues to the Agency as used in assessing financial efficiency?*

EC-2: *What is the Net Public Benefit of the forest road system?*

Closely related to the above questions but address in Appendix M is key question EC-3 which asks:

"What are the maintenance costs of the existing road system? How does that compare to recent forest road budgets and projections of future road budgets?"

When stated the analysis of question EC-1 relies on data presented by key question EC-3.

EC-1: *How does the road system affect the direct costs and direct revenues to the Agency as used in assessing financial efficiency?*

General Analytical Process

In this analysis we examined whether the Agency's revenues covers its direct budget costs, as specifically related to roads. With timber revenues a driving force in generating road maintenance funds, we stratified the analysis by timber suitable and timber unsuitable lands. Timber suitability was defined by land management allocations outside of riparian reserves. Other factors such as soil and wildlife management requirements were not considered deciding factors. This coarse stratification is a sufficient for a forestwide analysis. Most timber haul routes will need to travel some distance through timber unsuitable lands to reach the mill; however, these roads will mostly be primary and secondary roads which are not considered a

changing element in this analysis. Objectives for private lands are not controlled by the Forest, however, money is spent on maintaining roads within the Forest's private land inholdings and therefore these areas are included in the analysis. The stratification of the Forest Plan management allocations is shown in the table below.

Table 1. Stratification of Land Management Allocations

Classified	Management Areas
Harvest	10A, 10B, 11A, 11B, 11C, 11D, 11E, 11F, 14A, 17,
Noharvest	1, 1-6E, 2A, 2B, 4, 5A, 6D, 6E, 7, 8, 9B, 9C, 9D, 10C, 10E, 10F, 12A, 12B, 13A, 13B, 16A, 16B
Private	All nonfederal land within the forest proclaimed boundary
Water	All water bodies within the forest proclaimed boundary

Using the above stratification, the current transportation system is describe as an inventory of direct costs and direct revenues of the roads on the Forest. External costs were not included in this analysis. An external cost is one caused by the agency and imposed on some other party without compensation, such as polluting water, or degrading scenic beauty. In this same token external benefits such as enhanced property values were also not investigated. Revenues include estimation of future revenues from timber harvest from both harvest and no harvest allocations.

A primary goal of this analysis is to examine the fiscal effectiveness of maintaining or decommissioning roads in areas with and without a flow of long-term revenues. Because of their direct applicability, the results and interpretation of this analysis will utilize the same costs presented in the Results section for key question EC-3.

Results

As presented in key question EC-1, to maintain the current road system to its prescribed maintenance level would require approximately $3.4 million dollars. This is the total amount regardless of its current stratification. The table below breaks down the $3.4 million dollars according to harvest, nonharvestable, and private lands.

Table 2. Road Inventory and maintenance costs.

Category	Maintenance level	Miles	Unit cost/mile	Average cost
Harvest	none	318		
	1	417	$ 50-$ 100	31,275
	2	2,406	$ 100-$ 400	601,500
	3	671	$ 500-$1,500	671,000
	4	56	$ 800-$3,000	106,400
	5	105	$2,500-$5,000	393,750
			subtotal	1,803,925
No-harvest	none	187		
	1	188	$ 50-$ 100	14,100
	2	1,213	$ 100-$ 400	303,250
	3	373	$ 500-$1,500	373,000
	4	61	$ 800-$3,000	115,900
	5	138	$2,500-$5,000	517,500
			subtotal	1,323,750
Private	none	411		
	1	30	$ 50-$ 100	2,250
	2	279	$ 100-$ 400	69,750
	3	108	$ 500-$1,500	108,000
	4	12	$ 800-$3,000	22,800
	5	12	$2,500-$5,000	45,000
			subtotal	247,800
			total	**3,375,475**

Using the road maintenance costs presented under key question EC-3, the approximate expenditure to maintain roads located matrix lands is $1.8 million and $1.3 million in lands where no programmed timber harvest is planned. Roads located on private land are expected to cost approximately $248,000 a year.

Roads in all stratifications provide direct revenues. Revenues below are based on a compilation of several sources. The predicted future volume of timber on our harvestable lands is base on estimations calculated during implementation of the Northwest Forest Plan and represent our best look into the future production of timber commodities. Predicted timber volume of thinnings on non-harvestable lands was predicted in the Mid Willamette Late Successional Reserve Assessment (USDA 1998). This estimate is limited to only Late Successional Reserves. Value per unit for timber volume was estimated based on the 1997 TSPIRS report. The value of $197/mbf accounts for all timber direct and indirect costs (costs associated with appeals and litigation) outside of road revenues and expenses. The value of $197/mbf for is the resulting balance for 1997s regeneration harvest and commercial thins volumes combined. The value of timber from LSRs which will be strictly commercial thins can be expected to be lower.

Table 3. Timber related revenues

Stratification	Product	Predicted future volume (MBF)	Revenue/MBF	Revenue from commodity harvest and recreation per year	
				First decade	Out decades
Harvest	Regen/thin	136,000	$197	$26,792,000	$26,792,000
No-harvest	thin	32,000	$197	$6,304,000	0
			Total	$33,096,000	$26,792,000

Sources of additional revenues outside of timber include grazing, land uses, minerals, recreation and special uses. During fiscal year 1997 we collected $341,311 (USDA, 1997). These collections are historically very small compared to timber revenues; however, would not exist without the availability of roads. These additional revenues were derived from the National Forest Statement of Receipts for fiscal year 1997.

When revenues from commodity harvest are compared to road maintenance costs, costs on harvestable lands are well below the revenues they generate. This is also true for nonharvestable lands for the next decade as commercial thinning continues to promote late successional conditions. These results are supported by the 1997 TSPIRS report where timber harvest netted $17 million dollars once all costs were accounted. Costs accounted for include KV related activities; however, do not include payments to states. If payments to states (25 million in 1997) were included the forest would have a net loss in revenue. Important to point out; however, is payments to states must be met regardless of timber revenues. With no timber revenues the net loss would be much greater than 8 million.

Regardless of sufficient timber revenues, the road maintenance budget does not fund roads to prescribed maintenance levels. Decommissioned roads provides an opportunity to make an initial investment and reduce future long-term maintenance costs. Decommissioning a sufficient number of roads will bring our current maintenance costs in alignment with the budget. This is discussed in the next section.

Decommissioning Costs

Decommission costs range greatly depending on the unique characteristics of the road and its surrounding topography. Below is a reiteration of the decommission costs from key question EC-3.

Table 4. Decommissioning Costs

Risk level	Unit cost per mile
low	$ 2,000-$ 5,000
moderate	$ 5,000-$15,000
severe	$15,000-$30,000

Most roads in areas of no harvest (primarily LSRs) and private land will not financially pay for themselves after the next decade. An analysis was completed to study 3 opportunities for these roads. Maintenance level 2 roads are used in these examples because of they make up the bulk of the roads under consideration for change.

1. No change, continue to maintain the road at its prescribed level
2. Decommission the road so no additional maintenance or repairs are needed
3. Close the road and drop its maintenance and repairs to a minimal level.

Under these three scenarios the following assumptions were made:

1. Under the no change scenario, maintenance costs are $250 a year, repair costs are $1,600 expected every 10 years.
2. To decommission the same mile of road would cost $10,000 of initial investment and no additional expenses such as repairs would be expected.
3. To close the same road would cost $2,000 for closure, $100 a year in minimal maintenance, and $1,600 expected every 10 years for repairs.

The goal is to find which scenario(s) prove to be financial viable over the next 20 years by requiring a 20 year discounted investment less than the no change alternative. Under the above assumptions, the no change scenario would require a discounted investment of $5,459. To decommission the same road would require an upfront investment of $10,000 with no additional expenses expected. The second scenario does not make sense to implement for solely fiscal reasons. It is far cheaper to maintain the road at $5,459 as opposed to spending $10,000 to decommission. To close the road would require a discounted investment of $5,270. In other words it would be cheaper to close the road than to keep it open; however, the two scenarios are very close.

An increase or decrease in any one of the above assumptions would change the 20 year discounted investment and possibly alter its status as financially viable or not.

Below is a summary of the sensitivity of the assumptions under each opportunity:

1. Under the no change scenario, if maintenance costs were greater than $600 a year then decommissioning the road would make sense. A maintenance cost of greater than $600 a year, however, is unlikely. The highest maintenance cost estimated for a maintenance level 2 road is $400 dollars a year. If repair costs exceed $5000 every ten years then decommissioning the road would make sense. This change is also highly unlikely. Repair costs are derived from actual repair costs from two large storm events over the last 44 years on the forest and inflated to 1998 dollars. To account for smaller storms where repair costs records were not located, anticipated repair costs were increased approximately 20%. Increasing the costs to 5,000 per mile per decade requires the expectation for damage to increase three fold over the next twenty years from that of the last 44 years.
2. If decommissioning costs were reduced to or below $5,500 per mile then decommissioning would be a viable option over maintaining the road at its current prescribed level.
3. If closing the road increased from $2,000 to $2,500 or maintenance costs increase from $100 to $125, or repair costs increase to more than $1,800 every ten years then it would no longer make sense to close the road but to maintain.

Under these scenarios a typical road not posing a high risk to the environment or safety would not make economic sense to decommission. Decommissioning roads with an objective to bring the road maintenance costs in alignment with the budget is not recommended. Closing roads may be a viable option under the above assumptions; however, the difference in the 20 year discounted investment is less than $200 dollars, so careful analysis of costs would be important.

Interpretation

This assessment presents a disturbing picture of the current road system and its budget. To continue to maintain the roads as efficiently as possible with the current budget will eventual result in roads not maintained to a level safe for users and managers nor environmentally sound. Currently a one-time investment of dollars to decommission roads strictly to bring the road system in alignment with the current budget levels is also not fiscally responsible unless costs presented in this paper change significantly. There will, however, be roads that need to be decommissioned because they pose environmental costs that make them worthy of decommissioning.

Worthy goals of the Forest should be:

- ✧ Decommission roads that pose environmental hazards and/or safety hazards.
- ✧ Look for opportunities to reduce the miles of roads that do not or will not contribute substantially to future timber commodities, recreation, or other legitimate uses on the forest.
- ✧ Close roads after careful analysis of their costs versus other opportunities.

- ✧ On the remaining roads minimize direct road costs in order to maximize financial efficiency.

A one-time investment of dollars to decommission roads strictly to bring the road system in alignment with the current budget level is not recommended under current decommissioning costs.

EC-2: ***What is the Net Public Benefit of the forest road system?***

Discussion

An economic analysis of net public benefit played a small role in the Road Analysis. The overall objective discussed during the first Road Analysis meeting was providing an assessment that will help managers decide the merits of closing, relocating, upgrading, or decomissioning exisiting roads and building new roads. Driving forces meeting this objective will most probably be biophysical and financial factors and not specifically measured by net public benefits. In addition, the true measure of net public benefit can not be obtained. Some outputs and effects cannot be adequately valued in the time frame allocated and without the use of social analysis techniques.

During subsequent NEPA analyses where alternatives are evaluated, an economic analysis that results in a ranking of alternatives in relation to their Net Public Benefit and benefit/cost ratio would be useful to the decision maker. Results from the ecological and social analyses completed for this assessment will provide input for the economic analysis of alternatives from which response coefficients can be applied. Scale for this project will be driven more by the scale from which specific alternatives are analyzed.

Process Critique - All questions

External costs were not included in this analysis. An external cost is one caused by the agency and imposed on some other party without compensation, such as polluting water, or degrading scenic beauty. In this same token external benefits such as enhanced property values were also not investigated. Attempts to measure the value of the costs in benefits in dollars can be largely subjective. These factors, however, do influence the decision making process. In cases where non-priced benefits are impossible to value in a marketplace they still need to be weighed by the decision maker.

Examples of information not considered or known in this economic analysis are listed below. These items also represent examples of cost and benefits that may necessitate decommissioning roads despite the direct costs.

Following is a list of incomplete accounting costs for closing or decommissioning existing roads:

- ✓ Less fragmentation of habitat
- ✓ Less erosion and stream sedimentation
- ✓ Increased soil productivity

- ✓ Less introduction of exotic species
- ✓ Less risk of fire
- ✓ Less litter and other human impacts
- ✓ Less wildlife stress
- ✓ Less modification of ecological processes
- ✓ Less noise
- ✓ Less pollution
- ✓ Less road kill
- ✓ Potential increase in unroaded area
- ✓ Loss for excluded uses and users
- ✓ Increased management cost
- ✓ Increased cost for research that requires access
- ✓ Increased inventory and monitoring cost

Another key piece of missing information is future revenues from timber commodities. Though actual revenues for 1997 were used, timber values and overall revenue are sensitive to the marketplace, harvest levels, and current management practices.

References

USDA Forest Service, Willamette National Forest. 1955-1998. Willamette National Forest Annual Report.

USDA Forest Service. 1990. *Land and Resource Management Plan*, Willamette National Forest.

USDA Forest Service, Forest Service Handbook 1909. 19 88. Economic and Social Analysis Handbook, 1909.17.

USDA Forest Service, Willamette National Forest. 1997a. Statement of Timber Sale Revenues and Expenses, TSPIRS.

USDA Forest Service, Willamette National Forest. 1997b. National Forest Statement of Receipts, All Resources Reporting.

USDA Forest Service, Willamette National Forest. 1998. Mid Willamette Late Successional Reserve Assessment.

USDA Forest Service, Washington Office. 1998. Road Analysis: A Procedure for Informing Management Decisions on the Future Characteristics of the National Forest Transportation System.

Phillips, Richard. 1998. Personal communication. Region 6, Regional Economist.